SOME NEW BOOKS.

A New History of America.

SECOND NOTICE.

We have already reviewed that part of Mr. EDWARD JOHN PAYNE'S *History of the New World* (Macmillans), which relates to the discovery. More than half, however, of the first volume now issued is allotted to a study of aboriginal America, and this seems to deserve separate and extended notice, both by reason of the care bestowed upon the narrative and of the particular theory of the progress of peoples in civilization adopted by the author. Let us first mark what Mr. Payne has to say regarding the origin of the natives of the western hemisphere, and then look at his explanation of the social condition of the Peruvian, Muyscan, and Maya-Mexican groups at the time of the Spanish conquest.

I.

Mr. Payne accepts the Turanian origin of the American aborigines, which was first maintained by the English antiquary, Edward Brerewood. He recognizes that the only theory capable of seriously competing with it is that of Morton and Agassiz, which supposes a separate creation or evolution of the human species on the soil of the New World. Even were the latter theory established it would still be demonstrable that the conditions of such creation or evolution were such that very similar human types would be produced on both continents in the person of the Red Indian and the Tartar. The author of this history has no doubt that the new continent was in the possession of a race whose kindred still possessed the greater part of Asia, and had once possessed the whole of both Asia and Europe. What knowledge we have acquired of this pre-Aryan stock is summed up in a paragraph. The story of the Turanian race remounts to the distant period when Caucasian man had not yet emerged from his highland dwelling place. It is Mr. Payne's belief that there was once an era when the African negro and the Asiatic Tartar or Turanian divided the Old World between them. The negro race was not confined to the continent of Africa; it also occupied the southern parts of Asia, the Asiatic archipelago, and the great continental island of Australia. Over the rest of the Old World the Turanian race roamed at will, and gradually multiplying in the milder climate of central Asia, it waxed aggressive, and ultimately dispossessed the negro of all but his African birthplace.

It is possible to reconstruct the ethnological features of this second era in which Caucasian man was still in obscurity and Turanian man possessed all Asia, including the great western peninsula which we call Europe. The skulls of the close of the geological quarternary period which have been found in France, in England, and in Belgium, are of the Turanian type. The Basques in the west, the Finns and Esthonians in the north even now exist as relics of the Turanians of Europe; and the Turanian Rassena of Etruria have disappeared within historical times. Equally within historical times Turanian races have been dispossessed of western, central, and eastern Europe by the inroads of Celtic, Teutonic, and Slavonic tribes. In the time of Herodotus they held the greater part of the European Continent. In Siberia, Tartary, India, and China they still hold the greater part of Asia. The process of wresting the world from the Turanian stock has been going on ever since the Caucasian race in its Aryan, Semitic, and Hamitic divisions appeared on the scene. India, where Turanians still dwell by millions under various names, passed under Aryan domination at a comparatively early epoch. The Turanian civilization of Chaldea and Susiana was overrun by the Semites of Assyria. The great Turanian kingdom of Medea was conquered by the Aryan Persians. The oldest language committed to cuneiform writing is a Turanian language, and that system of writing which, in Semitic hands, became the basis of modern alphabets, is of Turanian origin. Over these early Tartar civilizations Caucasian man had already prevailed at the dawn of history. The conquest of Central Asia by the Russians, which is going on at the present day, is a continuation of the same process; and precisely the same process has been going on in America ever since Caucasian man reached it, and made in it a permanent abiding place after its discovery by Columbus. Mr. Payne, as we have said, regards it as indisputable that the New World was peopled by the Turanian race, and it follows that no sooner had the Caucasian arrived than the struggle which constitutes one of the greatest historical processes of the Old World, was renewed in the New. The Turanians still possessed in the Old World a vaster inheritance than any rival race; in the New World they had no rivals until the fatal arrival of Caucasian man in the person of Columbus. Many thousands of years, in all probability before the rise of Caucasian civilization in the valleys of the Nile and the Euphrates, the wild hordes that swept from one end to the other of Europe and of Asia had found a way across Behring Straits and poured in an incessant stream over the American continent. That a very long period had elapsed since the original migrations, when Europeans first became acquainted with the American aborigines, is rendered certain by a comparison of the languages and physique of the various aboriginal tribes among themselves and with their kindred in Asia; and the same conclusion is indicated by the events which are alleged to have taken place on American soil before the white man reached it.

Now, as to the events which preceded the Spanish conquest. It is certain that more than one form of social organization, having more or less claim to the title of civilization, had already appeared on the American continent. Among these has usually been reckoned, though it is not so reckoned in this history, that of the so-called "mound builders." Mr. Payne, indeed, is well aware that over a great part of North America, and especially the basin of the Mississippi and its tributaries, are scattered the remains of huge rectilinear and circular earthworks. In connection with them are found the burial places of a race of men acquainted with many necessary arts of life, and with the use of copper. Stones sculptured with animal figures and a species of picture writing, open and raised spaces once apparently the sites of temples and of other large buildings, and clearings of vast extent which have at one time been subjected to a husbandry of no rude character and connected by broad highroads, mark the settlements of the mound builders, and have been thought to indicate the existence on the soil of the United States of a great semi-civilized people. The great earthworks which have procured this race its distinctive name are often overspread by the growth of a forest apparently primitive. All memory of them had long passed away when the European settlers began to contest the soil of what is now the United States with the mere savages whom they found in possession of it.

Such at least is the view which used to be held by American antiquaries, but it is now abandoned by the most competent and distinguished among them, and it is rejected in the history before us. A keener criticism discovers the mound builders to be an excusable historical illusion, due partly to an imperfect Indian ethnology and partly to the desire to discover on North American soil some analogue to the civilizations of Peru and Mexico. Mr. Payne agrees with the latest and most trustworthy American students of the subject in believing that the mysterious mound builders were simply the ancestors of the Indians of the Mississippi Valley. Every relic of their supposed civilization corresponds with something that can be clearly traced to ordinary Indian hands, and in spite of the opinion formerly prevailing to the contrary, traditions have here and there survived, attributing the great earthworks of the Ohio to the red man's ancestors. These traditions ascribe their construction to an age not very remote, when those ancestors were more numerous and prosperous than in historical times, and when they were liable to attack in the course of southward migrations which were taking place on the Pacific side of the continent. The history of the mound builders thus rightly interpreted simply merges in the general story of the American aborigines.

The now exploded theory of an ancient and extinct civilization, accounting for the historical relics of the so-called mound builders, was based, as we have said, on the presumed analogy of two peculiar forms of social organization, which the Spanish conquerors had found and destroyed, the one in the valley of Mexico, and the other in Quito and Cuzco, in South America. It was hardly to be expected that the Spanish invaders should determine with critical exactness the degree of civilization that had been attained under the governments which they overthrew. Filled with the rude romance of their age, dazzled by the golden treasure they had gained, and bewildered by the vast extent of country which the overthrow of the Aztec and the Inca Governments nominally added to the dominions of the Spanish Crown, they described themselves as the conquerors of mighty and civilized nations, and they strained their memory and their imagination to the utmost for the purpose of justifying their claim in the eyes of their countrymen. No flattery being too gross for national vanity, Spanish historians accepted with undoubted faith the glowing accounts which were transmitted to them, and believed that Spain had overturned two empires as mighty as the world had ever seen. From Spain these historical romances rapidly spread over Europe, and from Europe they in time found their way back to America. Rational history unwillingly reduces the wondrous exploits of Cortes and Pizarro, and the mighty Governments which they overthrew, to a comparatively humble level; and in the science of man, which the present century has created, the subjects of Montezuma and Atahualpa scarcely stand out above the general level of the American natives. For a detailed criticism of these once celebrated conquests we are referred to a subsequent and not yet published volume of this work. For the moment, and until he has developed his own theory of the conditions of advance in civilization, the author merely repeats the conclusion of Robertson and Macaulay that neither the Mexicans nor the Peruvians are entitled to rank with those nations which merit the name of civilized, and that, in a broad view of the New World, they merge in the mass of the Indian aborigines.

It is certain that the Tartar race type, with its dull physiognomy, reddish brown skin, beardless chin, agglutinative speech, and cold and impassive temperament, is common to all the American natives. But the main type, as was to be expected, had undergone countless local variations. In stature, in physical force, in facial conformation, and, to some extent, even in color, the aborigines exhibited strange contrasts. Here and there where the surrounding conditions were favorable, a noble and graceful type of man was produced. It is Mr. Payne's opinion that Turanian man reached his perfect physical development in Kentucky and Virginia, as Aryan man did in the Hellenic and Italian peninsulas. At no great distance from these higher types manifestly inferior ones were to be found. In language the contrasts are no less striking. Side by side in many parts there still exist tribes speaking languages without any apparent resemblance. The author of this history would not seek the explanation of this dissimilarity in the hypothesis that such tribes migrated from different and distant parts of Asia, and possibly at different times. It rather indicates prolonged isolation on American soil, and Mr. Payne considers it quite possible that, in the absence of literature, traditional or written, the entire surface of grammar and vocabulary has in the course of many centuries been shifted, though the substantive material and the agglutinative form remain the same. In the social state of the different tribes like contrasts were observable. The Mexicans and Peruvians, though immersed in what we now know to have been a gross barbarism, dwelt in cities, and lived in a state which was capable of being exaggerated by superficial observers into the semblance of civilization. Elsewhere, as in the great basin of the Mississippi and in some parts of the Atlantic coast, the natives cultivated the soil with some method, and had permanent villages. But in by far the greater part of the New World man was yet in the hunter stage. Articulate speech, the knowledge of fire, and the use of rude implements of stone and wood, but poorly distinguished him from the lower mammals. The human brute roamed from plain to plain, finding at once his business and his pleasure in war, in the chase, in the reproduction of his species, and in some uncouth forms of superstition. It was indeed the discovery of America that first introduced the human brute, or perfect savage, to the knowledge of Europe. Hitherto the "wild man" had been a legendary and heraldic animal like the griffin and the phœnix. Every shore which Europeans had frequented, except, perhaps, the still unconquered islands of the Canary group, had presented some semblance of civilized life. The anthropophagus, or man-eating man, was as little within European experience as the Cyclops. The voyage of Columbus made him as familiar in Europe as the negro or the Moor; and the Indian name Carib, or Caribbee, in its modified shape of cannibal, has continued in use to the present day, as the denomination of the savage who feasts upon human flesh. This revolting practice, prevailing among a few tribes, lent to the New World a dark and odious coloring which proved hard to efface. Little more than a century ago the entire continent was conceived as peopled by numerous groups of savage races, differing little in manners, and universally known as Americans. Occasionally a divine or philosopher described their indolence, drunkenness, and ferocity; sometimes they were contrasted in the spirit of Tacitus with the corrupt inhabitants of civilized Europe. Grave, hospitable, reverencing their ancestors, and yet passionately devoted to liberty, they supplied those who insisted on the decay of modern civilization with an apt illustration. The knowledge Europe really possessed regarding them was but limited. Even Burke, who knew more of America than any of his contemporaries, believed them in the mass to be cannibals.

II.

It is when he undertakes to explain the scope and limitations of the Spanish conquests in the New World that Mr. Payne has occasion to define the stage in the process of human advancement which had been reached by the Mexicans and Peruvians. Regarding the former people, he quotes with qualified approval a sentence from Macaulay's essay on Clive, in which they are described as "savages who had no letters, who were ignorant of the use of metals, who had not broken in a single animal to labor, who wielded no better weapons than those which could be made out of sticks, flints, and fishbones; who regarded a horse soldier as a monster, half man and half beast; who took a harquebusier for a sorcerer, able to scatter the thunder and lightning of the skies." The author of this history considers these few lines worth all the ponderous romances which have been written on Mexican "civilization." The Peruvians are pronounced even lower in the scale of humanity. It must not be supposed, however, that Mr. Payne concurs with Macaulay in describing either the Mexicans or Peruvians as "savages" in what may be called the scientific meaning of the term. He would call them, more exactly, "barbarians," and it is in order to show just how far and why they fell short of being "civilized" that he propounds his theory of human advancement. The evidence for this theory is to be more fully brought forward in the next volume of this work, but it is stated and to some extent defended in the book before us. Concisely formulated, Mr. Payne's assertion is that the step from barbarism to civilization is taken by a given community when the provision of the food supply has been thoroughly organized on an artificial as distinguished from a natural basis. When the proof of this assertion has been completed in the second volume, he expects to demonstrate how the organization of food provision on the artificial basis has been combined with that of defence, and how communities in which these combined organizations have been fully elaborated have extended their boundaries at the expense of others whose social arrangements were less advanced. The writer disclaims any preconceived intention of importing such general topics into a history of the New World. But being compelled for the purposes of his inquiry to investigate the nature and origin of civilization, he was unable to find, already formulated, any solution of the problem sufficiently definite to be capable of practical application to the particular cases presented in aboriginal America.

It is indeed imperative that a historian of America should answer the questions, first, whether the advanced aboriginal communities discovered in the New World can properly be ranked as belonging to the class of civilized nations; and, secondly, whether their advancement, whatever rank may be assigned to it, was imported, either wholly or partially, from the Old World, or was entirely of indigenous growth. The older writers usually represented the Mexicans and Peruvians, more especially the former, as highly civilized peoples; later critics have described them as utter savages. Mr. Payne's view is, as we have said, that the truth lies between these extremes, but that it is nearer to the latter than to the former. He believes that the facts to be presented to the reader in his narrative, and particularly in the second volume, will show that the stage of advancement reached in Mexico and Peru fell short of that degree to which the name of civilization can properly be applied. The Mexicans and Peruvians were barbarians; that is, while possessing a material basis sufficient to support a low degree of civilization, their habits of thought and life remained essentially savage. The Mexican warriors, the most advanced class found in America, were cannibals; in both Mexico and Peru regular human sacrifices formed an essential part of the scheme of life. Cannibalism, indeed, was unknown in Peru, though it existed among the Indians of the forest districts to the eastward of the Andes and to the northward of the northern limit of the Inca dominion; this is attributed to the fact that the Peruvians possessed large domesticated food animals, which were wanting in Mexico.

In most respects the Peruvians were lower than the Mexicans. In Mexico there existed a rudimentary commerce, carried on in the valley by boats on the lakes, and in other districts by porterage. Slavery, an important element in the earliest advancement of peoples, had come into existence; cotton cloths, cacao beans, gold dust, and slaves served as the means of exchange. In Peru, so far as appears, commerce was unknown; there was no recognized medium of exchange, nor was there any division of labor except that between the warrior and the cultivator. The Mexicans had a greater variety of foods and were more skilled in preparing them than the Peruvians. The Mexicans not only depicted with great facility natural and imaginary objects in various colors, both on cloth and on a species of paper, but they had invented a conventional series of abbreviated pictorial signs, which approximately answered the elementary purposes of writing. This pictography, though known to some other North American peoples, was practised in none of the advanced districts except Mexico; no mode of assisting the memory existed in Peru except the *quipu*, or knotted cord. Both the Mexicans and the Peruvians had a rudimentary practical geometry; the former divided the circle accurately into segments for the purpose of constructing calendar stones, and made maps showing not only the lands of each village, but the general distribution of the country. Of the geometry of the Peruvians we have no evidence except their architecture, and this proves nothing except the existence of some simple method of linear measurement. Religion, together with sacrifice, its essential embodiment, was more completely developed in Mexico than in Peru; in the former country, as appears from the author's account of the worship of Tezcatlipoca, religion was already leavened, although but slightly, with morality.

The calendar of Mexico was far more advanced than that of Peru. The Mexican warriors were better organized, and more courageous than those of Peru; in the latter country the desperate and protracted defence made by the Mexicans against Cortez could never have been maintained. The ornamental architecture and sculpture of the Mexican people were superior to those of the Peruvians; compared with the carvings of Teahuanaco, for example, those of Palenque have almost the appearance of having been executed by civilized artists. On the other hand, the Peruvians were better skilled than the Mexicans in the working of metals. They were clever and original potters and admirable stone masons. There is nothing in Mexico to compare with the agricultural terraces of Peru. Lastly, the Mexican language was better developed than the Quichua or the Aymara. Mr. Payne thinks that it would be difficult to compose such a book as the great work of Sahagun in either of the Peruvian languages. In a confederacy like that of the Mexican people, the art of speaking was necessarily cultivated; the "palavers" of Montezuma recorded by Bernal Diaz show considerable power of expression. Some of the prayers given in Sahagun's work, undoubtedly native in substance and form, evince the same quality in a higher degree. In Peru, on the other hand, oratory seems to have been unknown; the extant fragments of ancient speech belonging to the period anterior to the conquest are of extreme simplicity. In the copious Mexican of Sahagun little of the substance of the Gospel narratives is lost, whereas a certain amount of simplification has been necessary in translating them into Quichua and Aymara.

So much for Mr. Payne's view of the stage of advancement attained in Mexico and Peru. It is also his belief that although the American aborigines had immigrated as savages from the Old World, the aboriginal advancement of America was of indigenous origin. If, indeed, we accept his fundamental theory that human advancement is universally based on the conversion of natural food resources, already known to savage tribes, into an artificial basis of subsistence, we must regard the indigenous origin of the advancement as practically involved in the statement of the theory; for the llama and the paco, the potato, the manioc, and the maize, indigenous to the New World, were absolutely unknown in the Old, while the corresponding bases of agriculture and herdsmanship in the Old World were equally wanting in the New. It seems indisputable that the American aborigines had reduced to cultivation every indigenous food plant at once capable of cultivation and worth the trouble of cultivating, and had domesticated every indigenous animal capable of profitable domestication. An advancement based on the use of indigenous food materials, which positively exhausts the list of plants and animals available for the purpose, all of which have apparently been utilized by savages before becoming the basis of an artificial food supply, is manifestly itself indigenous. To this the author does not hesitate to add, although a contrary opinion once obtained, that no people in a low grade of advancement has ever been raised to a higher one by the arrival, as an isolated incident, of a small body of individuals belonging to some more civilized country. Advancement cannot be imported, so to speak, in single parcels; a constant communication must be maintained during a considerable time between the pioneers of civilization and the country of their origin. Otherwise a process inevitably takes place, if not at once, then in the next or following generations, for which our language has no name, but which was well known to the Greeks by a term which meant the dropping down from a superior social status into barbarism. The newcomers quickly sink to the level of the aborigines; the legendary colony of Iolaus in Sardinia, described by Diodorus, is a typical instance. Retrogression is as natural to humanity as progress, and far easier.

It is not denied by Mr. Payne that historically civilization rests upon religion in some form as its basis, and it is interesting to note how he reconciles his acceptance of this fact with his theory of human advancement. He deems it sufficient for his argument to point out that religious conceptions occur in the stage of natural subsistence, technically known as savagery, and that their presence is manifested by the practice of offering food and drink to invisible beings most conveniently described as "spirits," who are understood to exercise a favorable influence over human fortunes, especially in regard to the food supply. This practice has been continued and developed when the food supply has been organized on an artificial basis; religious ritual has thus been moulded to its definitive form under the influence of agriculture or herdsmanship, or of both combined, as the case may be. These invisible beings visibly embodied in the form of gods have, in other words, been transferred concurrently with man himself from a natural to an artificial basis of subsistence. This general theory of sacrifice, although in Mr. Payne's book it appears as a deduction from the general law of advancement, is, of course, not new; that the purpose of sacrifice was simply to feed the gods was admitted on all sides in the controversies which accompanied the diffusion of Christianity in the ancient world. In the Old World, as in the New, it was understood that invisible beings were endued with force by the shedding of blood and the combustion of flesh; the altar was merely the table on which food and drink were set before the languishing deity. To the ancients, as to the aboriginal Americans, a religion without sacrifice appeared to involve a contradiction in terms, and to be in substance and in fact mere atheism. The monstrous waste involved in the sacrifices of Peru had, indeed, led to attempts to reduce the number of deities, and even, it is said, to a project for abolishing the worship of all except the primitive creator god, Pachacamac. The authorities, however, explicitly state that the rites of the new monotheism were of a sacrificial character. The American aborigines never reached the conception of religion without sacrifice. It is shown in this history that the alleged non-sacrificial monotheism of Nezahualcoyotl is a mere fable. This conception, at once rational, humane, and economical, was utterly unknown in the New World previously to the introduction of Christianity. Now, as to the parallelism sometimes observed between the religious and cosmological ideas of the New World and those of the Old—a parallelism here and there so close as to suggest doubts as to the genuineness of the former, especially in instances so striking as that of the Peruvian account of the creation. Mr. Payne tells us that his practice in dealing with alleged facts of this kind has been to begin by rejecting them, to search for facts which might corroborate or discredit the statement, and only to admit them after a vigorous scrutiny. He says, however, that such a process has usually resulted in the admission of much which at first appeared incredible. He himself entertains no doubt that the Peruvian legend of the creation is a genuine remnant of indigenous thought. His inference is that during the earlier stages of advancement the human mind works everywhere in much the same way.

It should be added that many views on minor questions, hitherto generally accepted, are rejected in this history. The author, for example, discards as purely fictitious several Mexican divinities of whom we hear from the Spanish chroniclers. He also reduces considerably the importance usually assigned to sun worship in Peru; by way of compensation he has indicated for the first time the significance and prominence of the same form of religion in Mexico. A more curious and widely spread misconception, the socialism often alleged to have existed in Peru under the Incas, is, we are told, to be corrected in the next volume. Meanwhile Mr. Payne does not hesitate to assert that nowhere have the distinctions of rank and the rights of property been more rigidly maintained than under the severe despotism of Peru. The so-called socialism, when examined, proves, he says, to be nothing but the forced common labor exacted from the peasantry. Russia or Turkey might with equal propriety be quoted as examples of State socialism.

M. W. H.

The Ice Age Not so Long Ago.

The latest addition to the "International Scientific Series" is a volume bearing the title of *Man and the Glacial Period*, by Dr. G. FREDERICK WRIGHT, to whose work is appended a paper on tertiary man by Prof. HENRY W. HAYNES. This book presents a summary of the latest researches, conclusions, and surmises relating to the subject. The author recognizes his obligations to the late Mr. James Crowl, Prof. James Geikie, and Sir Archibald Geikie, and to many other investigators, but he is himself an independent student and thinker whose competence and authority are undisputed. In this notice we shall confine ourselves to the sections of his expositions that deal with the cause and date of the Ice Age, and with the relics of man and animals which are referable to it. We should merely premise that the geological period discussed by Mr. Wright has been variously designated. By some writers it is simply called the "post-tertiary" or "quaternary"; by others the term "post-pliocene" is used, to indicate more sharply its distinction from the latter portion of the tertiary period; by others, again, this nicety of distinction is expressed by the term "Pleistocene." But since the whole epoch was peculiarly characterized by the presence of glaciers which have not even yet wholly disappeared, it is always referred to in this book under the name of "Glacial Period." We should also mark at the outset that for reasons which we here pass over, but which are set forth at length in the fifth chapter of this book, the author discards the hypothesis of an inter-glacial epoch and looks upon the whole glacial period as constituting a grand unity with minor episodes.

I.

To what are we to attribute the phenomena of the glacial period? Mr. Wright states, but is disposed to reject, the astronomical explanations of the phenomena suggested by Crowl, Ball, and Drayson. He deems it questionable whether the astronomical causes adduced by them would bring about any appreciable effect while the distribution of land and water was substantially what it is at the present time. He admits, however, that the unknown elements of the problem are so numerous and so far-reaching in their possible scope that a cautious attitude of agnosticism with respect to the cause of the glacial period is most scientific and becoming. He is nevertheless ready to say that in his opinion Mr. Upham's theory, to which Prof. Joseph Le Conte has given his approval, comes nearest to giving a satisfactory account of all the phenomena. Concisely stated, Mr. Upham's theory is that the passage from the tertiary to the quaternary or glacial period was characterized by remarkable oscillations of land level and by corresponding changes of climate and of ice accumulations in northern regions; that the northern elevation was connected with subsidence in the equatorial regions; that these changes of land level were both initiated and in the main continued by the interior geological forces of the globe; but that the very continental elevation which mainly brought on the glacial period added at length in the weight of the ice which accumulated over the elevated regions a new force to hasten and increase the subsidence which would have taken place in due time in the natural progress of the orographic oscillations already begun. The fact that the land after the removal of the ice load did not return to its former height in the pliocene period is pronounced proof positive that there were other and more fundamental causes of crust movement at work besides mere weighting and lightening. The land did not return to its former level because the cycle of elevation, whatever its cause, which commenced in the pliocene and culminated in the early quaternary, had exhausted itself.

It is foreseen by Dr. Wright that the theory provisionally adopted by him will be regarded by many with disfavor owing to their disinclination to suppose any great recent changes of level in the continental areas. So firmly established do the continents appear to be that it seems like invoking an inordinate display of power to have them exalted for the sake of producing a glacial period. It is, nevertheless, unquestionable that within certain limits the continents are exceedingly unstable, and that they have displayed this instability to as great an extent in recent geological times as they have done in any previous geological period. When one reflects, moreover, upon the size of the earth, a continental elevation of 3,000 or 4,000 feet upon a globe whose diameter is more than 40,000,000 feet seems an insignificant trifle. On a globe one foot in diameter it would be represented by a protuberance of barely one-thousandth of an inch. A corresponding wrinkle upon a large apple would require a magnifying glass for its detection. Again, the activity of existing volcanoes and the immense outflows of lava which have taken place in the later geological period, together with the uniform increase of heat as we penetrate the deeper strata in the crust of the earth, all point to a condition of the earth's interior that would make the elevations of land which Dr. Wright invokes for the production of the glacial period easily credible. Physicists now believe, indeed, not in the entire fluidity of the earth's interior, but rather in a solid centre where gravity overcomes the expansive power of heat and maintains the solidity even when the heat is intense. But between the cooling crust on the earth's exterior and a central solid core there is now believed to be a film where the influences of heat and of the pressure of gravity are approximately balanced and the space is occupied by a half-melted or viscous mass, capable of yielding to a slow pressure and of moving in response to it from one portion of the enclosed space to another where the pressure is from any cause relieved.

As a result of prolonged inquiry respecting the nature of the forces at work both in the interior and upon the exterior of the earth, and of a careful study of the successive changes marking the geological period, Dr. Wright and they who concur with him in accepting Mr. Upham's theory are convinced that the continental elevations necessary to produce the phenomena of the glacial period are not only entirely possible but easily credible and in analogy with the natural progress of geological history. There are two causes in operation to produce a contraction of the earth's volume and a shortening of its diameter. Heat is constantly being abstracted from the earth by conduction and radiation, but perhaps to a greater extent through ceaseless volcanic eruptions, which at times are of enormous extent. It requires but a moment's thought to see that contraction of the volume of the earth's interior means that the hardened exterior crust must adjust itself by wrinkles and folds. For a long period this adjustment might show itself principally in gentle swells, lifting portions of the continent to a higher level, accompanied by corresponding subsidence in other places. This gradually accumulating strain would at length be relieved along some line of special weakness in the crust by that folding process which has pushed up the great mountain systems of the world. The ice age, however, is supposed to have been brought about, not by the strongly marked folds in the earth's crust which have produced the mountain chains, but by the gentler swell of larger continental areas whose strain was at last lightened by the folding and mashing together of the strata along the lines of weakness now occupied by the mountain systems. The formation of the mountains seems to have relieved the accumulating strain resulting from the continental elevations, and to have brought about a subsequent subsidence. It is to be noted that we are not wholly without evidence that the readjustments of land level, which went on so vigorously after the middle of the tertiary period, are still going on with considerable though doubtless with diminished rapidity. There has been since the glacial period a re-elevation of the land in North America, amounting to 230 feet upon the coast of Maine, 500 feet in the vicinity of Montreal, from 1,000 to 1,600 feet in the extreme northern part of the American continent, and in Scandinavia to the extent of 600 feet. In portions of Scandinavia the land is now rising at the rate of three feet in a century. Other indications of even the present instability of the earth's surface occur in places too numerous to mention.

Yet while Dr. Wright declares himself increasingly confident that the main causes of the glacial period have been changes in the relations of land levels connected with diversions of oceanic currents, he admits it to be by no means impossible that these were combined with the astronomical causes propounded by Mr. Crowl and other physicists. By some this combination is thought to be the more probable because of the extreme recentness of the close of the glacial period. The continuance of glaciers in the highlands of Canada down to within a few thousand years of the present time coincides in a remarkable manner with the last occurrence of the conditions favorable to glaciation upon Mr. Crowl's theory, which occurrence took place about eleven thousand years ago.

II.

Passing from the cause to the date of the ice age, let us see what Dr. Wright has to say upon the latter point. He begins by analyzing the data directly relating to the length of time which separates the present from the glacial period. These data are mainly connected with two classes of facts. First, the amount of erosion which has been accomplished by the river systems since the glacial period, and, second, the amount of sedimentation which has taken place in lakes and kettle-holes. The strongest evidence from erosion is presented on the American continent. Thus the present Niagara River is purely a post-glacial line of drainage, and the gorge extending from Lewiston up to the present falls represents the work done by the river since that point of time in the glacial period when the ice barrier across the Mohawk Valley broke away. The problem here propounded is a simple one. Considering the length of this gorge as the dividend, the object is to find the rate of annual recession, which will be the divisor. The quotient will be the number of years which have elapsed since the ice first melted away from the Mohawk Valley. Dr. Wright accepts the conclusion of the latest geological authorities on the subject, including the members of the United States Geological Survey, that if we can rely upon the uniformity of the conditions in the past, seven thousand years ago is as distant a date as can be assigned to its commencement. A second noteworthy glacial chronometer is found in the gorge of the Mississippi River, extending from the Falls of St. Anthony at Minneapolis to its junction with the pre-glacial trough of the old Mississippi at Fort Snelling. Here, too, the problem is comparatively simple, and the annual rate of recession having been determined, it has been computed that the total length of time required for the formation of the gorge above Fort Snelling is a little less than eight thousand years, or about the same stretch of time as that calculated for the Niagara gorge.

These and other data forthcoming in America and Europe have led Dr. Wright to accept the theory of Mr. Prestwich that all the phenomena of the glacial period, toward the close of which we are now living, can be brought within the limits of thirty or forty thousand years. The better to estimate the degree of credibility with which we may regard this theory, we are invited to fix our minds upon the significance of the large numbers with which we are accustomed to multiply and divide geological quantities. Few people realize either the rapidity with which geological changes are now proceeding or the small amount of change which might produce a glacial period, and fewer still have an adequate conception of how long a period a million years is and how much present geological agencies will accomplish in that time. At the rate which erosive agencies are now acting upon the Alps, their dimensions will be reduced one-half in a million years. At the present rate of the recession of the Falls of St. Anthony, the whole gorge from St. Louis to Minneapolis would have been produced in a million years. A river lowering its bed a foot in a thousand years would in a million years produce a cañon a thousand feet deep. If we suppose a glacial period to have been brought about by an elevation of land in northern America and northern Europe, proceeding at the rate of three feet a century, which is that now taking place in some portions of Scandinavia, this elevation would amount to 3,000 feet in 100,000 years, and that is probably all, and even more than all, that is needed. One hundred thousand years, therefore, or even less, might easily include both the slow coming on of the glacial period and its rapid close. The most characteristic phenomena of the ice age would extend over a much shorter tract of time, and be referable to a more recent date. After making all reasonable allowances, Dr. Wright considers that Prestwich's conclusion that 25,000 years is ample time to allow to the reign of the ice of the glacial period (of course the ice would begin to form long before it could be said to reign) as by no means incredible, or upon *a priori* grounds, improbable. This conclusion, with regard to the duration of the ice age and its distance from us in point of date, is a striking example of the growing tendency among astronomers and physicists to set narrower and narrower limits to geological time. It is no longer possible for geologists to refer the origin of life upon the globe back to a period distant by many millions of years from our own. Mr. George H. Darwin has shown from a series of intricate calculations that between 50,000,000 and 100,000,000 years ago the earth was revolving from six to eight times faster than now, and that the moon then almost touched the earth and revolved about it once in every three or four hours. From this proximity of the moon to the earth it would result that if the oceans had been then in existence, the tides would have been 200 times as great then as now, creating a wave 600 feet in height, which would sweep around the world every four hours. Such a condition of things would evidently be incompatible with geological life, and geology must therefore limit itself to a period which at the largest is inside of 100,000,000 years. Approaching the question from another point of view, Sir William Thomson, Prof. Tait, and Prof. Newcomb seem to demonstrate that the radiation of heat from the sun is diminishing at a rate such that even ten or twelve million years ago it must have been so hot upon the earth's surface as to vaporize all the water, and thus render impossible the beginning of geological life until later than that period. As the generally accepted ratio for the palaeozoic, mesozoic, and cenozoic periods is 12:3:1, cenozoic time can represent but one-sixteenth of the whole. Now, cenozoic time embraces the whole of the tertiary period during which placental mammals have been in existence, together with the post-tertiary or glacial period, extending down to the present day. If, then, we accept the calculations of Sir William Thomson, Prof. Tait, and Prof. Newcomb, the time which has elapsed since the beginning of the tertiary period and the existence of the higher animals must be reduced to considerably less than one million years.

III.

In the appendix to the book Prof. Henry W. Haynes maintains, after a review of the latest data relating to the subject, that there is as yet no proof of the existence of man in the tertiary period. So far as the trustworthy evidence as yet collected is concerned, we are not warranted, he thinks, in carrying man's existence further back in time than the period variously described as post-tertiary, pleistocene, or glacial; that is to say, the geological period in which we are now living. On the other hand, the relics of man are many and indisputable during the ice age, by which is meant that part of the glacial period during which large tracts of Europe and North America, which now enjoy a temperate climate, were covered with glaciers. What renders these relics peculiarly interesting is the accompanying proof of a fact, which might have been presupposed from the climatic conditions accompanying the ice age—the fact, namely, that man's companions in the animal world were very different from those with which he is now associated. From the remains actually discovered in America we infer that, while the mastodon was the most frequent of the extinct quadrupeds with which man then had to contend on the western continent, he must have been familiar also with the walrus, the Greenland reindeer, the caribou, the bison, the moose, and the musk ox. In Europe the list of animals now there extinct, which were associated with man in the ice age, is considerably longer. The list includes the lion, now confined to Africa and the southern portions of Asia, but of which a large species ranged over Europe from Sicily to central England in glacial times. The sabre-tooth tiger, with tusks ten inches long, is now extinct, but the species was in existence during the latter part of the tertiary period, and continued on until after man's appearance in the glacial period. The same thing may be said of the leopard, whose bones are found as far north in England as paleolithic man is known to have lived, and of the hyena, two species of which are found in the bone caves of Europe. The elephant is represented in the pre-glacial and glacial epochs by several species, some of which range as far north as Siberia. The African elephant is not now found north of the Pyrenees and the Alps. A species of dwarf elephant but four or five feet in height occurs in Sicily, and still another species has been found in Malta whose average height was less than three feet. One extinct species, whose remains are found in the river drift and in the lower strata of sediment in many caves as far north as Yorkshire, was of unusual size, and during the glacial period was encountered on both sides of the Mediterranean. But the species most frequently met with in paleolithic times was the mammoth. This animal, now extinct, accompanied man in nearly every portion both of Europe and North America and lingered far down into post-glacial times. It was nearly twice the weight of the modern elephant and one-third taller. Occasionally its tusks were more than twelve feet long and curled upward in a circle. It had a thick covering of long, black hair, with a dense matting of reddish wool at the roots. It is the carcasses of this animal which have been found in the frozen soil of Siberia and Alaska. During the glacial period these animals must have roamed in vast herds over the plains of northern France, southern England, and the northern half of North America. The hippopotamus, also, during the glacial period, roamed as far north as Yorkshire, and his remains are found in close association with those of man, both in Europe and on the Pacific coast in America. Twenty tons of their bones have been taken from a single cave in Sicily. It has been suggested by Sir William Dawson that the hippopotamus may then have been adapted to arctic climates by a fatty covering, as the walrus is at the present time. The rhinoceros is now confined to Africa and southern Asia, but the remains of four species of this animal have been met with in America, Europe, and northern Asia in deposits of the glacial period. In 1771 a carcass of the woolly rhinoceros was found in the frozen soil of northern Siberia, and relics of other species have been found in the valley of the Somme and as far north as Yorkshire. In America the bones of the rhinoceros are found in the gold-bearing gravel of California in connection with human remains. At the present time only one species of the bear exists in Europe, but during the glacial period the grizzly bear, now confined to the western part of America, and the extinct cave bear, were companions, or rather life-long enemies, of European man. The cave bear was of large size, and his bones occur almost everywhere in the lowest strata of sediment in the caves of England. Besides these, and other animals now extinct in Europe, there were associated with man in the ice age the musk sheep and the reindeer, now confined to the regions of the far north, which formerly ranged as far as southern France, and mingled their bones with those of man.

To account for the strange intermingling of arctic and torrid species of animals, especially in Europe, during man's occupancy of the region in glacial times, various theories have been put forward, but none of them is regarded by Mr. Wright as altogether satisfactory. One hypothesis is that the bones of these diverse animals became mingled by reason of the great range of the annual migrations of the several species. The reindeer, for example, still performs extensive annual migrations, moving northward in summer to escape the heat, and southward in the winter to escape the extreme cold. Many, also, of the other animals above mentioned are more or less migratory in their habits. Thus it is thought that during the glacial period, when man occupied northern France and southern England, the reindeer, the musk sheep, the arctic fox, and perhaps the hippopotamus and some other animals annually vibrated between northern England and southern France, a slight elevation of the region furnishing a land passage from England to the Continent. Prof. Boyd Dawkins attempts to reduce the difficulty by supposing that the glacial epoch was marked by the occurrence of minor episodical periods of climatic variations during which, at comparatively short intervals, the isothermal lines vibrated from north to south, and *vice versa*. According to this view the southern species would gradually crowd upon the northern during the periods of climatic ameliorations until they reached their limit in central England, and they in turn, as the climate became more rigorous, would slowly retreat before the pressure of their northern competitors. The theory of Mr. James Geikie is that the period, while one of great precipitation, was characterized by a climate of comparatively even temperature, in which there was not so great a difference as now between the winters and the summers—the winters not being so cold and the summers not so hot as at present. This is substantially the condition of things in southern Alaska at the present time, where extensive glaciers come down to the sea level, even though the thermometer at Sitka rarely goes below zero of Fahrenheit. In order to clear the way for any of these hypotheses put forth to account for the mingling of arctic and torrid species, characteristic of the period under consideration in Europe, we must apparently assume not only a land passage from England to the Continent, but also such an elevation of the region to the south as to afford land connection between Europe and Africa. This would be furnished by only a moderate amount of elevation across the Strait of Gibraltar, and again from Italy to Sicily, and from Sicily to the opposite African shore. And in the distribution of species there are many indications of the existence of such a connection in late geological times.

It is also pointed out by Dr. Wright that the present capacities and habits of species are not an infallible criterion of their past habits and capacities. Both the rhinoceros and the mammoth of glacial times were probably furnished with a woolly protection which enabled them to endure more cold than their present descendants could do, while the elephant is even now known to be able to bear the rigors of climate at great elevations upon the Himalaya Mountains. It is a reasonable supposition that many species may have been formerly adjusted to quite different climatic conditions from those which now seem necessary to their existence. But as we have seen in the case of Alaska, the climate of Europe during the ice age may have been less severe than is generally imagined. Geikie's theory of the prevalence of an equable climate during a portion of the glacial period in Europe has been thought to have been further sustained by the character of the vegetation which then covered the region. At that time temperate and southern species of trees, like the ash, the poplar, the sycamore, the laurel, the fig tree, and the Judas tree, overspread all the low ground of France as far north, at least, as Paris. "It was," says Geikie, "under such conditions that the elephants, rhinoceroses, and hippopotamuses, and the vast herds of temperate cervine and bovine species ranged over Europe from the shores of the Mediterranean up to the latitude of Yorkshire, and probably still further north, and again, from the borders of Asia to the western ocean. Despite the presence of numerous fierce carnivora—lions, tigers, leopards, hyenas—Europe at that time, with its shady forests, its laurel-margined streams, its broad and deep flowing rivers, a country in every way suited to the needs of a race of hunters and fishermen, may have been no unpleasant habitation for paleolithic man."

THE WINDOW CLEANERS' GUILD.

New York Has a Branch of This Order of Scientific Polishers of Glass.

It was made known at a workingmen's meeting, held a night or two ago for the purpose of organizing a benefit fund for sick and disabled window cleaners, that there are about a hundred professional window cleaners in this city who find steady employment the year round, and that this band of special workers is part of a big corporation employing over 800 workingmen in Berlin, London, Breslau, Vienna, and Potsdam. The New York Guild of Window Cleaners was started two years ago, and its work differs from the labor of the ordinary window scrubbers in the fact that the guild workingmen use no water in cleaning windows, thereby doing away with the biggest nuisance that storekeepers have to put up with. The cleaning is done without swashing everything in the store window with dirty water.

The professional window cleaner of Gotham goes over the window pane first with a damp cloth to take off the dust. Then he sponges the glass with a cleaning paste made of alcohol and whitening powder, and then rubs the pane briskly with a chamois skin, and wipes it finally with a dry cloth. This gives it a polish. The cleaners come around once a week to each shop in their district. It takes them a quarter of an hour to clean the glass of an ordinary store window, and it costs a merchant a dollar a month to have the cleaning done. Each workingman is provided with a new-fangled sort of a ladder, built so that it cannot slip from the window, and can, if necessary, be lengthened from seven feet to sixty. These ladders are painted red, and they run up to a point at the top. This pointed top is placed in one corner of the window and sticks there while the cleaner stands against it and reaches over and scrubs the window.

The New York cleaners have organized a benefit guild similar to that in operation in all the European cities in which the professional cleaners work. The workmen pay 15 cents a week to the guild treasurer, and draw $4 a week in case of sickness.

THE FEZ AND ITS WEARERS.

A Picturesque Head Covering Seen in This Cosmopolitan City.

Since wearers of the genuine fez have come to live in New York the people of this town begin to see how the fez of the small boy caricatures this distinctive feature of Turkish dress. For nearly 100 years all subjects of the Porte, whether Mohammedan or Christian, have been required to wear the fez, and even temporary sojourners in the Turkish empire find this sort of headgear a protection from many impositions. In the few blocks of Washington street dominated by subjects of the Sultan you may see half a dozen fezzed heads on the sidewalk at almost any time of day. The fez emphasizes the foreign character of the scene and lends picturesqueness to a commonplace region.

The fez in Washington street is taller and darker than the fez of the boys' furnishing stores. It is usually a dark maroon in color, with a black tassel falling nearly to the edge of the fez. When properly worn the fez tilts back upon the head and the tassel falls behind. There are millions of fezzes made in the Morocco city from which they take their name, but perhaps more of those seen here come from Vienna, where there are large factories for the production of the fez. It is made of felt, and you buy fez and tassel separately, picking out a tassel to your taste. The fez for women is richly ornamented, and is sometimes made of plush. It is seldom seen in the Washington street colony.

The fez serves very well as a head covering even in warm climates, for, although it affords no shade, it is light, lighter, in fact, than the lightest stiff felt hat, and by reason of its height it interposes a column of air between the head and the direct rays of the sun. The fez costs from 40 to 60 cents, and lasts a long time, since it has no brim to wear out and is easily blocked and reshaped when damaged. The fez of Washington street is of the civilian variety. The military fez is taller. In Turkey it is a badge of citizenship and part of the official costume. Here it is a mere memory of home to the wearer, and to others a reminder that this is a cosmopolitan town.